

Attorney's Docket No.: 07043-015007
Client's Ref. No.: B92-011-6

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : M. Allen Northrup et al. Art Unit : 1634
Serial No. : 08/900,735 Examiner : Sisson, B.
Filed : July 24, 1997
Title : MICROFABRICATED REACTOR

Assistant Commissioner for Patents
Washington, D.C. 20231

DECLARATION OF WILLIAM J. EGAN, III

I, William J. Egan, III, hereby declare and state that:

1. I am a principal with the law firm of Fish & Richardson P.C., and attorney of record for Applicants in this matter. I am a member in good standing and registered to practice before the United States Patent and Trademark Office. I have personal knowledge of the facts contained in this declaration and can competently testify to them.

2. During the time frame of just before May 1, 1992 to August 31, 1992, I was a principal with the law firm Heller, Ehrman, White & McAuliffe ("Heller"). Also during this time frame, Lawrence J. Shaw ("Mr. Shaw") was a registered patent agent who worked with me at Heller, and who was involved in the preparation of the parent of the subject application. The parent application was filed on August 31, 1992 and issued as U.S. Patent 5,639,423 on June 17, 1997.

CERTIFICATE OF MAILING BY FIRST CLASS MAIL

I hereby certify under 37 CFR §1.8(a) that this correspondence is being deposited with the United States Postal Service as first class mail with sufficient postage on the date indicated below and is addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231.

January 5, 2000
Date of Deposit

Bridget Conger
Signature

BRIDGET CONGER
Typed or Printed Name of Person Signing Certificate

3. We exercised due diligence in this country in preparing and filing the parent application from the period extending from prior to May 1, 1992 to August 31, 1992, as evidenced by the following:

- On April 8, 1992, I had a telephone conference with Scott A. Taper, Jr. ("Mr. Taper") of the Office of Technology Licensing ("OTL") at the University of California, Berkeley regarding preparation of the parent application. Subsequently, on April 9, 1992, I spoke with Dr. M. Allen Northrup ("Dr. Northrup"), one of the inventors of the subject matter of the application, regarding its preparation. Specifically, we discussed the fact that we would prepare an outline of the application, which would be expanded on later in a future meeting with Dr. Northrup (Exhibit A).
- On May 11, 1992, I met with Dr. Northrup and Professor Richard M. White ("Prof. White"), the other inventor of the subject matter of the application. During the meeting, we discussed the content of the application as well as a schedule for the preparation of a draft of the application and a date by which we hoped to file it (Exhibit B, which includes notes of that meeting).
- On June 2, 1992, a rough draft of the parent application was faxed to Dr. Northrup and Prof. White. A copy of this draft was also sent to Mr. Taper (Exhibit C).
- After receiving the inventors' comments on the draft of June 2, 1992, the application was revised, and the revised draft was sent to Dr. Northrup and Prof. White on July 8, 1992 (Exhibits D and E).

Applicant : M. Allen Northrup et al.
Serial No. : 08/900,735
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Page : 3

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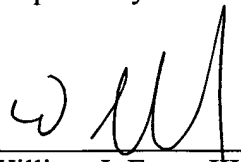
- Thereafter, the application was again revised and that draft of the application was sent via Federal Express on August 28, 1992 to Dr. Northrup and Prof. White (Exhibit F).
- On August 31, 1992, the application was filed in the U.S. Patent and Trademark Office. A copy of the filed application was sent to Mr. Taper, Dr. Northrup, and Professor White on the same day (Exhibit G).

4. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. § 1001 and that such willful false statements may jeopardize the validity of the application or any patents issuing thereon.

Respectfully submitted,

Date: _____

1/5/00



William J. Egan, III
Reg. No. 28,411

WJE/mxj

Fish & Richardson P.C.
2200 Sand Hill Road, Suite 100
Menlo Park, CA 94025
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Facsimile: (650) 854-0875

#15

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : M. Allen Northrup et al.

Art Unit : 1634

Serial No. : 08/900,735

Examiner : Sisson, B.

Filed : July 24, 1997

Title : MICROFABRICATED REACTOR

Assistant Commissioner for Patents

Washington, D.C. 20231



EXHIBITS FOR DECLARATION OF WILLIAM J. EGAN, III

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January 5, 2000
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Bridget Congar
Signature

BRIDGET CONGAR
Typed or Printed Name of Person Signing Certificate

A

TELEPHONE/PERSONAL CONFERENCE MEMO

Date 4/9/92 Time _____

Place _____

Conference with _____

Telephone: To _____

From S. Taper (4/8)Confirmation: Dr Northrup (4/9)

Required

Expected

File No. 18043-0021Client UCB

Matter _____

Attorney WJZ

Discussion Dr. Northrup's phone # is 510-422-1638
will submit an Abs. on 5/23/92 for
show, which is set for 7/21-7/25/92.
Abs, according Northrup, will not be
pub. until a date of show, ie 7/21.
Abs is keep confid until then.

we will prep. an outline of the app'l
& plan to meet w/ Northrup to
dis app'l further & flush
in w/ details that he has.

Memo Copy to _____

Signed _____

1

B

5/11/92

①

Key features:

BSAC

PCR or thermal-cycle driven
enzymatic reactions, but
includes other DNA (or
other biochem or chem) reactions

All techns. involving reaction-based
methodologies

Ability to integrate elec, mech
or optical comp's. using micro-fab
techs:

Reaction parameter control: heating,
pumping, circulating, cooling

Reaction or reagent detection-manipulation

see Fig. 1

Detect:
mass change,
density,
viscosity

WJE: Appl. described Fig. 2 chamber &
specific sys. for carrying out
PCR reactions. What are
minimum comp's. of such a system?
Bio chem reaction manip, control & detection:
① Lamb-wave devices - to pp, mix & detect;
② electrokinetic effects to pp, sep or preconc;
③ intergr-T^o control devices; ④ optical filters;
⑤ chamber w/ heating elements

C

HELLER, EHRMAN, WHITE & MCAULIFFE
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June 2, 1992

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WRITER'S DIRECT DIAL NUMBER

(415) 772-6149

18043-0021

Scott A. Taper, Jr.
Licensing Associate
University of California at Berkeley
Office of Technology Licensing
2150 Shattuck Avenue, Suite 510
Berkeley, CA 94704

Re: U.S. Patent Application for
Microfabricated Reactor

Dear Mr. Taper:

Enclosed is a copy of the rough draft of the patent application which was faxed to M. Allen Northrup and Richard M. White on June 2, 1992.

Very truly yours,

Heller, Ehrman, White
& McAuliffe



Carol Sowards
Secretary to Laurence J. Shaw
Registered Patent Agent

LJS:cls
enclosure

ATT

Allen Northrup

Dick White

5/11/92

thermal cycling

claim: mixing chamber; also
clai system.

micro liter vials \rightarrow used in system
smaller - can be done faster
w/ less power.

96 \leftrightarrow 550C \rightarrow heat & cool.
system on

Re-packaged/chips \rightarrow novel:
integ. on chips.

* PCR or any other ^{chem. or bio-chem} reaction that
requires thermal cycling.

Monolithic, microFab device \rightarrow
1st time such a sys
has been done on this scale.

use of hand-wheel as
moves particles in single

* ^{fine} chip to see if I have
fine or white's us
5,006, 149.

unifex: microheaters in chamber
next part of inv. / system.

Fiber optic inside reaction chamber
for detection.

PCR techs now take about ^{1 to 5 minutes} ~~1 to 2 hours~~
~~of inv. can get results in~~
~~1 to 5 minutes.~~ Fastest is
micro. in time. ~ can get
results in a few seconds.
re cycles on the order of
a cycle. Due to small
vols & high surface area.
could be portable & work w/
batteries as opposed to 110V.

~~to diff. surfaces~~
Reactions dep. on concentration
* 3 volts in chamber & work in seconds

on \rightarrow 3 volts in 96°C based on heater Res.
 off \rightarrow 1/2 volts in 55°C " "

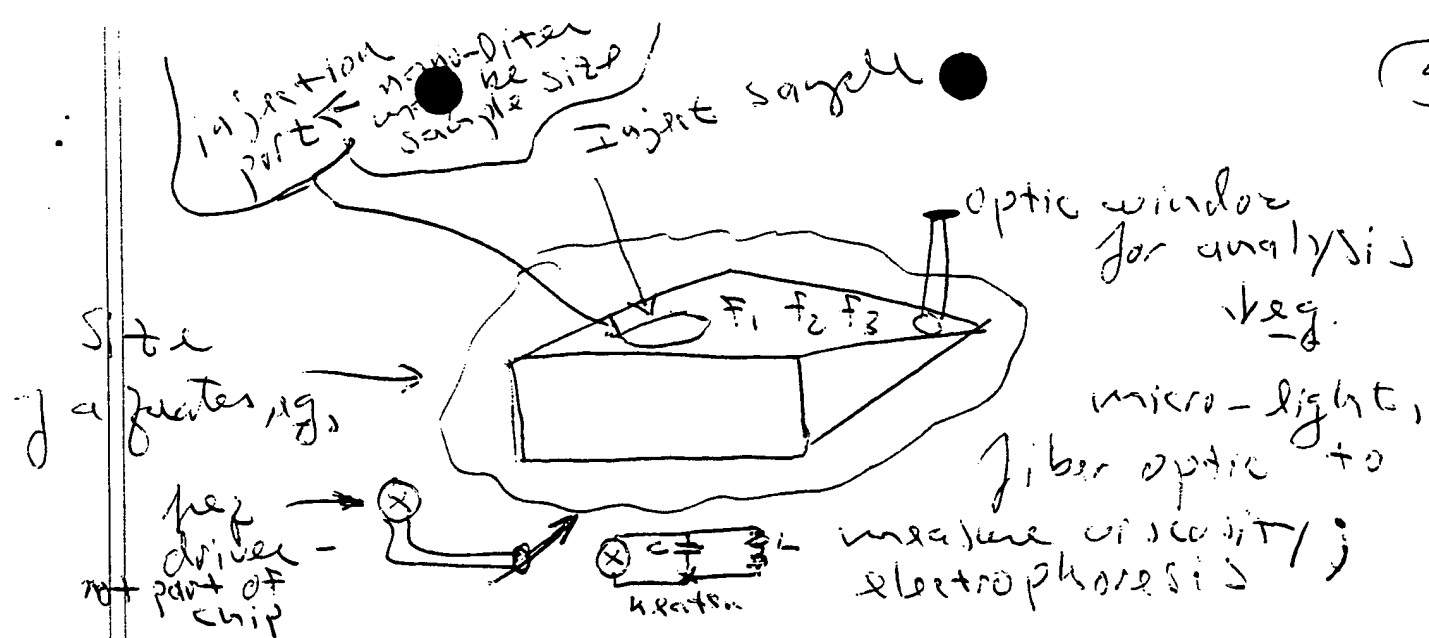
Monolithic Forb — is very important
 — can do in batches on
 wafers. Thus they are
 cheap & are disposable.

* Need spec sheet for chamber
 fabrication

Ppling in chamber — re Dick
 white

Chamber — includes ultrasonic
 agitator for mixing.

\downarrow Also useful for cell dispensing



pump, mixer etc run
a diff pres; (F_1 , F_2 , F_3) so
can turn diff comp on & off
by opening a diff pres.
Heating is also done by turning F_4
in heater.

Key doing PCR on chip w/
reaction chamber.

~~Materials~~ Materials used in chamber
can negatively effect PCR
reaction eg. Buffer
divalent cations will prevent
PCR from doing.

Reactants on chip in advance
& sold as a unit.

Use of surface tension to maintain reactants
in reactant container.

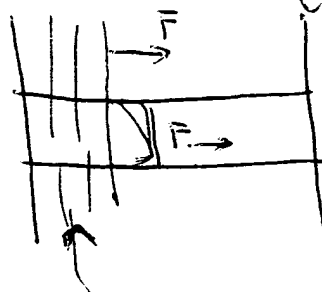
Possible talks / pubs : none on
the horiz; Oct 1992

Draft appl to Inverters by bagling
to mid-June & file by end
of June

* Remote drive

Ads: All parts of channels moved at
same speed - adv. of carb-
vane PP.

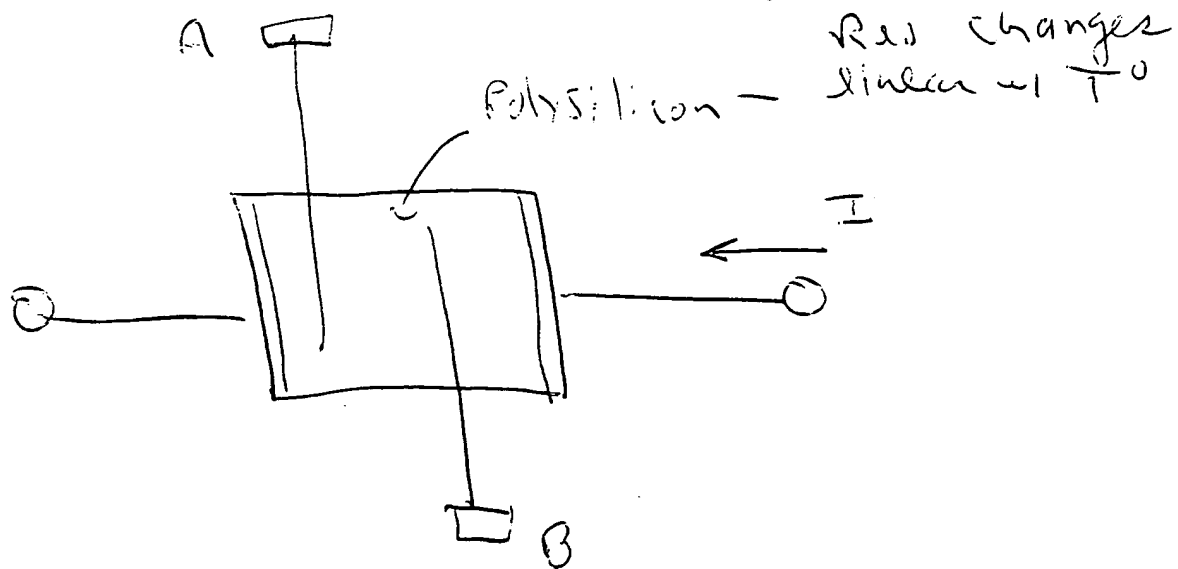
dee whitens
WS 5,006, 749



Blunt Flow
- more solid

Lamb-wave
generators

T^0 control \rightarrow Nice feature.



Use ~~less~~ ^{electrodes} A + B to measure T^0 change. Send in known current I + measure voltage bet. electrodes A + B.

This detail should be in log.

SiO_2 - is material at bottom
of chamber; std material
handled by bio-chemists

DNA probes - in chamber;
parts attach to probes + sensor
detect mass
change so know have attachment
to probes.

7

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July 8, 1992

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18043-0021

M. Allen Northrup, Ph.D.
Engineering Research Division
LAWRENCE LIVERMORE NATIONAL LABORATORY
P.O. Box 808
Livermore, California 94551

Re: U.S. Patent Application
MICROFABRICATED REACTOR

Dear Allen:

Enclosed please find the latest draft of the above-referenced patent application, as well as the previous draft with your comments. Please give me a call after you review the document.

Very truly yours,

Heller, Ehrman, White
& McAuliffe

Laurence J. Shaw
Laurence J. Shaw
Registered Patent Agent

LJS:cls
Enclosures
cc: William J. Egan, III (w/o encl)

E

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WRITER'S DIRECT DIAL NUMBER

771-6149

18043-0021

Professor Richard M. White
Berkeley Sensor and Actuator Center
497 Cory Hall
UC Berkeley
Berkeley, California 94720

Re: U.S. Patent Application
MICROFABRICATED REACTOR

Dear Richard:

Enclosed please find the latest draft of the above-referenced patent application, as well as the previous draft with your comments. Please give me a call after you review the document.

Very truly yours,

Heller, Ehrman, White
& McAuliffe

Laurence J. Shaw/cls
Laurence J. Shaw
Registered Patent Agent

LJS:cls
Enclosures
cc: William J. Egan, III (w/o encl)

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HELLER, EHRMAN, WHITE & MCAULIFFE
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August 28, 1992

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WRITER'S DIRECT DIAL NUMBER

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18043-0021

2672211640

VIA FEDERAL EXPRESS

2672211651

Richard M. White
350 Panoramic Way
Berkeley, CA 94704

M. Allen Northrup
923 Creston Road
Berkeley, CA 94708

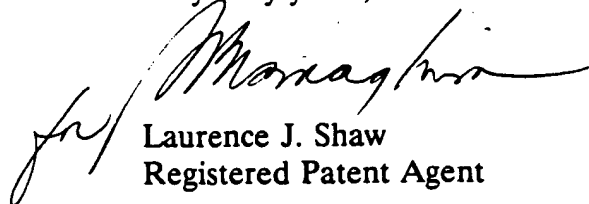
Re: U.S. Patent Application
MICROFABRICATED REACTOR

Gentlemen:

Enclosed for your review is the latest draft of the above-identified patent application. This application incorporates the changes and suggestions made to date.

This application is to be filed on Monday, August 31. Please contact me on Monday morning with your comments, if any.

Very truly yours,


Laurence J. Shaw
Registered Patent Agent

Enclosures
cc: William J. Egan, III (w/o enc,)

G

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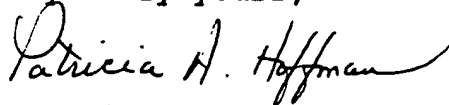
Scott A. Taper, Jr.
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Re: U.S. Patent Application for
Microfabricated Reactor

Dear Mr. Taper:

Enclosed is a copy of the subject patent application
which was submitted to the U.S. Patent and Trademark Office for
filing today.

Very truly yours,



Patricia A. Hoffman
Secretary to Laurence J. Shaw
Registered Patent Agent

enclosure

cc: M. Allen Northrup (w/encl. and original photo)
Richard M. White (w/encl.)
William J. Egan, III (w/encl.)